



Meðaltalsgildi þyngdar í 15 sinnum 30
mínútna reitum

Gunnar Þorbergsson

Greinargerð GP-88-02

Meðaltalsgildi þyngdar í 15 sinnum 30 mínútna reitum

Inngangur

Í janúar 1984 gaf Orkustofnun út skýrslu um þyngdarmælingar og tilheyrandi landmælingar við Hengil (Gunnar Þorbergsson o. fl. 1984). Þær er m. a. gerð ítarleg grein fyrir útreikningi þyngdar í mælistöð, landslagsleiðréttingu og frávikum frá þyngdarstaðli ("free-air" frávik og Bouguer frávik).

Þegar komið var að því að gefa út skýrslu á sama hátt um þyngdarmælingar á landinu öllu, bættust 660 mælistöðvar við gögnin (þyngdarmælingar DMA, ITECH og OS sumarið 1985). Síðan hefur verið unnið við landslagsleiðréttigar fyrir þær stöðvar, og er því ekki að fullu lokið.

Á meðan þeirra niðurstaðna er beðið, hefur þörf fyrir gögn, eins og þau, sem sýnd eru í töflum 3 (fyrir land) og 4 (fyrir sjó), komið í ljós. Þær innihalda meðaltöl hæða mælistöðva, "free-air" fráviks og Bouguer fráviks, svo og meðalfrávakin frá meðaltölum þeirra stærða, í reitum, sem ná yfir 15 mínútur breiddar og 30 mínútur lengdar. Reitirnir þekja svæðið frá 63° til 67° norðlægrar breiddar og frá 12° til 26° vestlægrar lengdar.

Þær sem töflurnar verða m. a. notaðar á erlendri grund, er nauðsynlegt og réttlætanlegt að hafa skýringar við þær á ensku. Tafla 1 inniheldur skýringarnar. Í töflu 2 eru þyngdarmælistöðvar á landi í nokkrum reitum, þær sem breyting þyngdarsviðsins er mest.

Heimildir

Gunnar Þorbergsson, Ingvar Þór Magnússon, Ásgeir Gunnarsson, Gunnar V. Johnsen, Axel Björnsson: *Landmælingar og þyngdarmælingar á Hengilssvæði 1982 og 1983*. Orkustofnun, OS84003/VOD03 B, 58 s.

English translation

The National Energy Authority (Orkustofnun) published in January 1984 a report on land surveying and gravity measurements in the Hengill area (Gunnar Thorbergsson et al. 1984, in Icelandic). The computation of gravity at a gravity station, terrain correction, and free-air anomalies and Bouguer anomalies are explained in that report.

As we were preparing the publication of a report on gravity measurements throughout Iceland, 660 gravity stations were added to the data (measurements by DMA, ITECH and NEA in the summer of 1985). We have since been working on terrain corrections for that stations. That work is not yet finished.

In the meantime, the need for data, as shown in Tables 3 (for land) and 4 (for sea), has become apparent. The tables contain mean values of station elevations, free-air anomalies and Bouguer anomalies, as well as deviations from the mean values, computed for gravity stations in compartments of size 15 minutes of latitude and 30 minutes of longitude. The area covered by the compartments is between 63° and 67° north, 12° and 26° west.

Since the tables will be used in other countries, it seems necessary and justified to write their explanation in English. The explanations are in Table 1, whereas gravity stations in those compartments on land, where the gravity field variations are largest, are listed in Table 2.

Table 1. Explanation of terms

Tables 3 (for land) and 4 (for sea) contain mean values and standard deviations of quantities defined at gravity stations, computed in compartments as follows:

Size of compartments: 15' x 30' (15' latitude x 30' longitude)

The boundaries of each compartment are evident from the lay-out.

Area covered by compartments: 63° – 67° north, 12° – 26° west

ϕ northern latitude

λ western longitude

N number of gravity stations in a compartment

H elevation of a gravity station

F free-air anomaly at a gravity station

B Bouguer anomaly at a gravity station

The tables contain a tag and the quantities N , \bar{H} , σ_H , \bar{F} , σ_F , \bar{B} , σ_B computed as follows, where each sum is computed for one compartment:

Tag is = { 2(180 - λ) } // { 4(90 - ϕ) } (symbolic formula)

$$N = \sum 1$$

$$\bar{H} = \frac{1}{N} \sum H \quad \sigma_H = \sqrt{\frac{1}{N-1} \sum (H - \bar{H})^2}$$

$$\bar{F} = \frac{1}{N} \sum F \quad \sigma_F = \sqrt{\frac{1}{N-1} \sum (F - \bar{F})^2}$$

$$\bar{B} = \frac{1}{N} \sum B \quad \sigma_B = \sqrt{\frac{1}{N-1} \sum (B - \bar{B})^2}$$

On land terrain corrections were made within 9,903 m from each station.

A correction for a truncated Bouguer plate of radius 9,903 m was made.

A topographic correction for the annulus between radii 9,993 m and 167,000 m was then applied.

In all cases the rock density 2.60 g/cm³ was used.

At sea a correction for a truncated plate of radius 6,653 m was made.

A correction due to a sloping bottom within this plate was made, in a few instances, where such a correction was significant.

A topographic correction for the annulus between radii 6,653 m and 167,000 m was then applied.

The density (2.60 - 1.03) g/cm³ was used at sea.

Gravity measurements carried out 1967 - 1973 were used.

There are 1564 gravity stations in 203 compartments on land.

There are 1935 "gravity stations" in 249 compartments at sea.

The IGSN71 gravity standard was used.

Table 2. Gravity stations in compartments with large variation of anomalies						
Tag	Latitude (°)	Longitude (°)	Elevat. (m)	Station number	Free-air (mGal)	Bouguer (mGal)
03180099	65.02934	20.87300	359.40	3100	43.3	4.2
03180099	65.19883	20.96150	295.79	3098	46.7	14.7
03180099	65.11816	20.93533	267.74	3099	36.9	7.7
03180099	65.10900	20.69617	386.69	3078	47.5	5.7
03180099	65.19600	20.52500	374.89	3084	47.3	6.4
03180099	65.21367	20.76417	189.37	3104	35.3	14.9
03180099	65.01000	20.67017	439.17	3079	35.9	-12.1
03190098	65.48050	20.31017	40.02	2718	22.2	25.1
03190098	65.31184	20.06717	440.43	2741	39.6	-7.8
03190098	65.49900	20.10000	197.60	2713	39.5	21.3
03190098	65.35533	20.03433	510.19	2838	56.2	0.9
03190098	65.34033	20.12167	205.43	2860	23.6	2.8
03190098	65.41583	20.29783	5.71	2720	23.5	26.3
03190098	65.26950	20.10133	450.98	2786	45.8	-3.0
03190098	65.30566	20.06333	421.82	2862	39.2	-6.1
03190098	65.28200	20.11933	386.94	2843	39.4	-2.6
03190098	65.36716	20.22867	34.64	2841	11.8	11.0
03190098	65.26950	20.13350	385.22	2844	39.5	-2.4
03190098	65.37483	20.13450	575.79	2755	70.3	9.0
03190098	65.27734	20.32550	466.39	2779	52.2	1.8
03190098	65.27016	20.23717	360.40	2780	38.9	-0.2
03190098	65.37317	20.03400	516.62	2756	58.9	2.7
03190098	65.47717	20.41950	126.77	2721	38.5	25.4
03190098	65.28100	20.01150	419.45	2842	40.2	-5.4
03190098	65.36383	20.32533	279.01	2840	47.5	17.7
03190098	65.38267	20.03767	563.54	2754	65.0	4.3
03190098	65.30400	20.10467	91.14	2861	3.1	-2.4
03190098	65.39100	20.23250	44.10	2719	15.9	16.6
03190098	65.35717	20.12450	518.14	2839	59.2	5.1
03190103	64.01000	20.39583	104.30	3399	53.4	42.4
03190103	64.02917	20.21750	90.50	3606	47.3	37.7
03190103	64.22583	20.02683	450.70	3335	65.6	17.2
03190103	64.13284	20.32800	66.18	3614	34.5	27.7
03190103	64.09950	20.23283	371.20	3340	72.2	34.2
03190103	64.14333	20.03467	614.30	3338	77.0	12.3
03190103	64.06800	20.46417	58.63	3615	33.5	27.4
03190103	64.06250	20.14383	244.02	3339	54.8	29.3
03190103	64.13067	20.18567	326.40	3341	54.7	20.3
03190103	64.22066	20.34650	84.90	3049	26.5	17.6
03190103	64.19817	20.20450	384.20	3342	60.5	21.0
03210105	63.67900	19.46650	247.42	3270	51.0	30.6
03210105	63.59100	19.44067	737.81	3250	127.2	50.8
03210105	63.51767	19.14033	541.35	3248	98.6	43.9
03210105	63.51450	19.41167	98.60	3240	54.8	46.7
03210105	63.74900	19.45867	592.00	3256	79.4	18.1
03210105	63.53900	19.27083	622.36	3249	110.4	47.5
03230097	65.54400	18.07583	62.45	3680	5.6	3.7
03230097	65.50867	18.42450	913.60	3967	81.5	-14.2
03230097	65.61083	18.28867	836.38	3963	89.7	4.2
03230097	65.63517	18.18650	542.85	3943	67.3	11.5
03230097	65.66600	18.08417	1.20	3942	7.4	12.0
03230097	65.69633	18.35933	157.76	3816	19.0	6.9
03230097	65.72916	18.15150	2.60	3671	12.2	13.9

Table 2 (continued).

Tag	Latitude (°)	Longitude (°)	Elevat. (m)	Station name	Free-air (mGal)	Bouguer (mGal)
03230102	64.36400	18.31067	870.77	3358	75.1	-18.8
03230102	64.30967	18.23883	674.10	3351	62.9	-10.3
03230102	64.27550	18.37550	646.57	3350	65.2	-5.1
03230102	64.49966	18.09817	846.34	3371	57.7	-34.5
03230102	64.43117	18.11750	912.06	3360	68.4	-30.3
03230102	64.44750	18.33200	882.70	3359	66.0	-29.0
03230102	64.46167	18.48583	641.76	3394	48.9	-20.3
03240095	66.11417	17.88350	1.60	3805	35.3	37.3
03240095	66.03467	17.68367	5.50	3806	23.8	28.3
03240095	66.06000	17.86083	38.80	3949	34.3	36.3
03240095	66.15916	17.84867	1.80	3804	11.1	11.4
03240105	63.51817	17.97900	4.85	3172	49.6	49.7
03240105	63.72817	17.99500	26.92	3153	31.9	29.5
03240105	63.64950	17.83000	3.03	3170	36.7	36.9
03240105	63.57200	17.90567	3.58	3171	45.6	45.8
03240105	63.72867	17.65083	4.89	3178	29.2	29.2
03270103	64.06533	16.12150	2.65	4416	24.3	25.4
03270103	64.24667	16.10000	187.90	4413	23.1	16.7
03270103	64.13550	16.18633	592.63	4422	89.4	32.7
03270103	64.10783	16.30333	343.57	4421	39.7	3.9
03270103	64.07584	16.45800	733.65	4420	98.8	31.5
03290102	64.29617	15.32467	8.30	4426	28.1	28.0
03290102	64.47217	15.04917	284.20	4429	40.3	14.3
03290102	64.35867	15.45167	596.08	4401	84.9	28.2
03290102	64.32183	15.20833	45.75	4427	38.0	35.1
03290102	64.44917	15.43583	325.33	4424	37.5	6.9
03290102	64.40800	15.29900	17.39	4425	7.7	12.0
03290102	64.40600	15.09433	704.10	4432	100.0	29.2
03290102	64.49150	15.22650	178.20	4431	31.6	21.6
03290103	64.24184	15.18633	11.70	4400	32.8	32.2
03290103	64.23883	15.02333	3.20	4406	49.8	50.3
03290103	64.22750	15.47617	6.35	4404	17.6	17.6
03300102	64.42250	14.87017	124.00	4430	43.8	32.5
03300102	64.43916	14.65683	45.26	4434	38.0	37.2
03300102	64.30016	14.90833	0.80	4428	50.9	52.2
03300102	64.46033	14.79717	315.37	4433	51.0	21.5
03300102	64.40450	14.53700	3.10	4408	49.4	50.2
03300102	64.37283	14.76417	6.70	4414	43.6	43.5
03300102	64.38350	14.93700	51.16	4435	38.1	35.4

26.0°		Table 3				25.5°	
Latitude or tag	Point count	Elevation Mean (m)	Free-air anom. St.dev. (mGal)	Bouguer anom. Mean (mGal)	St.dev. (mGal)		
		67°					
3080092	0						
3080093	0						
3080094	0						
3080095	0						
		66°					
3080096	0						
3080097	0						
3080098	0						
3080099	0						
		65°					
3080100	0						
3080101	0						
3080102	0						
3080103	0						
		64°					
3080104	0						
3080105	0						
3080106	0						
3080107	0						
		63°					

25.5°		Table 3				25.0°	
Latitude or tag	Point count	Elevation Mean (m)	Free-air anom. St.dev. (mGal)	Bouguer anom. Mean (mGal)	St.dev. (mGal)		
		67°					
3090092	0						
3090093	0.						
3090094	0						
3090095	0						
		66°					
3090096	0						
3090097	0						
3090098	0						
3090099	0						
		65°					
3090100	0						
3090101	0						
3090102	0						
3090103	0						
		64°					
3090104	0						
3090105	0						
3090106	0						
3090107	0						
		63°					

21.0°		Table 3				20.5°	
Latitude	Point	Elevation or tag	Mean count	St.dev. (m)	Free-air anom. Mean (mGal)	Bouguer anom. Mean (mGal)	St.dev. (mGal)
67°							
3180092	0						
3180093	0						
3180094	0						
3180095	0						
66°							
3180096	0						
3180097	7	9.8	15.5	31.7	3.5	31.5	2.4
3180098	10	92.7	81.8	32.1	6.5	22.9	5.7
3180099	7	330.4	84.5	41.8	5.6	5.9	9.0
65°							
3180100	6	423.8	26.6	45.6	4.9	-0.4	4.7
3180101	8	496.1	224.2	55.6	19.8	3.1	7.5
3180102	8	456.2	146.1	56.8	13.8	8.0	5.0
3180103	9	90.4	48.6	39.5	7.3	30.2	6.2
64°							
3180104	10	34.0	31.7	48.2	4.5	44.7	2.8
3180105	1	13.3	0.0	50.1	0.0	48.9	0.0
3180106	0						
3180107	0						
63°							

		Table 3				19.0°	
Latitude	Point	Free-air anom.		Bouguer anom.			
or tag	count	Mean	St.dev.	Mean	St.dev.	Mean	St.dev.
		(m)	(m)	(mGal)	(mGal)	(mGal)	(mGal)
67°							
3210092	0						
3210093	0-						
3210094	0						
3210095	3	4.4	5.2	33.5	1.1	34.5	0.9
66°							
3210096	8	86.1	100.4	25.8	9.2	20.2	4.1
3210097	4	127.9	77.8	14.9	11.0	5.2	8.5
3210098	6	425.4	283.6	35.3	31.5	-7.9	5.2
3210099	16	638.5	90.0	51.1	6.3	-18.3	4.9
65°							
3210100	17	696.5	133.4	49.2	9.6	-26.1	5.4
3210101	8	748.5	168.7	63.2	16.1	-17.5	4.9
3210102	13	617.7	83.0	62.8	9.3	-4.2	6.7
3210103	12	554.3	101.9	59.9	8.7	0.5	5.0
64°							
3210104	13	712.5	172.2	79.8	20.9	4.0	5.8
3210105	6	473.3	245.9	86.9	30.6	39.6	12.6
3210106	5	108.2	133.5	56.0	8.4	48.0	3.9
3210107	0						
63°							

		Table 3						
15.0°		Latitude Point Elevation			Free-air anom.		Bouguer anom.	
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.
				(mGal)	(mGal)	(mGal)	(mGal)	(mGal)
		67°						
3300092	0							
3300093	0							
3300094	4	12.5	21.9	46.5	5.8	45.8	3.9	
3300095	4	6.9	10.9	39.3	1.8	39.8	1.0	
		66°						
3300096	8	64.6	122.4	39.2	16.8	33.4	4.0	
3300097	6	448.4	361.3	68.4	32.4	22.7	7.1	
3300098	8	399.0	240.3	56.9	22.7	14.8	7.0	
3300099	8	343.2	301.7	50.0	30.0	15.1	8.0	
		65°						
3300100	9	650.6	264.5	78.8	28.5	10.5	3.1	
3300101	6	356.5	349.7	45.5	39.0	12.5	1.9	
3300102	7	78.1	113.2	45.0	5.6	38.9	10.7	
3300103	0							
		64°						
3300104	0							
3300105	0							
3300106	0							
3300107	0							
		63°						

		Table 3						
14.5°		Latitude Point Elevation			Free-air anom.		Bouguer anom.	
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.
				(mGal)	(mGal)	(mGal)	(mGal)	(mGal)
		67°						
3310092	0							
3310093	0							
3310094	0							
3310095	0							
		66°						
3310096	1	0.8	0.0	35.0	0.0	35.7	0.0	
3310097	8	71.6	123.8	32.8	13.3	26.2	2.3	
3310098	7	264.4	325.1	48.9	35.3	21.8	2.3	
3310099	10	358.1	451.8	47.4	50.0	15.9	3.5	
		65°						
3310100	9	176.2	315.9	30.2	33.7	17.0	3.6	
3310101	6	1.5	0.7	21.8	8.2	23.9	6.5	
3310102	1	2.7	0.0	38.8	0.0	40.0	0.0	
3310103	0							
		64°						
3310104	0							
3310105	0							
3310106	0							
3310107	0							
		63°						

13.0°		Table 3				12.5°	
Latitude or tag	Point count	Elevation (m)	Mean (m)	St.dev. (mGal)	Free-air anom. Mean (mGal)	Bouguer anom. Mean (mGal)	St.dev. (mGal)
		67°					
3340092	0						
3340093	0						
3340094	0						
3340095	0						
		66°					
3340096	0						
3340097	0						
3340098	0						
3340099	0						
		65°					
3340100	0						
3340101	0						
3340102	0						
3340103	0						
		64°					
3340104	0						
3340105	0						
3340106	0						
3340107	0						
		63°					

12.5°		Table 3				12.0°	
Latitude or tag	Point count	Elevation (m)	Mean (m)	St.dev. (mGal)	Free-air anom. Mean (mGal)	Bouguer anom. Mean (mGal)	St.dev. (mGal)
		67°					
3350092	0						
3350093	0						
3350094	0						
3350095	0						
		66°					
3350096	0						
3350097	0						
3350098	0						
3350099	0						
		65°					
3350100	0						
3350101	0						
3350102	0						
3350103	0						
		64°					
3350104	0						
3350105	0						
3350106	0						
3350107	0						
		63°					

23.0°		Table 4						22.5°	
Latitude	Point	Elevation			Free-air anom.		Bouguer anom.		
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.	
					(mGal)	(mGal)	(mGal)	(mGal)	
		67°							
3140092	13	-159.8	44.0	44.4	3.0	55.3	5.7		
3140093	3	-64.0	13.0	30.9	2.7	35.4	3.6		
3140094	0								
3140095	0								
		66°							
3140096	0								
3140097	0								
3140098	0								
3140099	1	-66.0	0.0	33.4	0.0	37.7	0.0		
		65°							
3140100	0								
3140101	6	-58.8	14.4	47.7	3.9	51.6	3.3		
3140102	7	-68.0	20.7	51.1	2.7	55.5	3.3		
3140103	5	-58.4	10.5	47.5	3.8	51.4	3.9		
		64°							
3140104	4	-108.0	24.6	48.7	4.3	56.0	4.5		
3140105	14	-170.9	27.0	45.1	4.4	56.6	3.2		
3140106	10	-229.5	29.0	43.9	3.5	59.7	4.7		
3140107	10	-424.7	185.1	48.4	7.8	77.5	8.6		
		63°							

22.5°		Table 4						22.0°	
Latitude	Point	Elevation			Free-air anom.		Bouguer anom.		
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.	
					(mGal)	(mGal)	(mGal)	(mGal)	
		67°							
3150092	11	-137.9	34.7	41.6	3.5	51.0	5.4		
3150093	11	-77.8	14.3	33.7	2.7	39.1	3.1		
3150094	5	-71.6	5.1	28.8	1.3	33.7	1.4		
3150095	0								
		66°							
3150096	0								
3150097	0								
3150098	0								
3150099	0								
		65°							
3150100	0								
3150101	0								
3150102	2	-54.5	14.8	41.3	3.9	45.0	4.9		
3150103	6	-35.3	9.0	47.8	6.5	50.2	6.2		
		64°							
3150104	0								
3150105	12	-173.1	41.2	36.6	6.1	48.3	5.3		
3150106	12	-255.0	49.4	43.9	7.7	61.1	7.7		
3150107	11	-336.2	162.4	52.9	6.1	76.2	5.9		
		63°							

22.0°		Table 4						21.5°	
Latitude	Point	Elevation	Free-air anom.		Bouguer anom.				
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.	
				(mGal)	(mGal)	(mGal)	(mGal)	(mGal)	
		67°							
3160092	6	-152.5	30.7	44.9	1.9	55.2	3.1		
3160093	9	-105.6	16.5	38.5	2.6	45.7	3.6		
3160094	5	-92.2	20.3	30.8	1.8	37.0	1.5		
3160095	0								
		66°							
3160096	0								
3160097	0								
3160098	0								
3160099	0								
		65°							
3160100	0								
3160101	0								
3160102	0								
3160103	0								
		64°							
3160104	0								
3160105	7	-124.1	19.5	32.9	3.6	41.3	3.7		
3160106	9	-154.8	20.0	45.8	3.6	56.5	4.8		
3160107	10	-528.2	245.4	32.9	9.2	68.2	7.7		
		63°							

21.5°		Table 4						21.0°	
Latitude	Point	Elevation	Free-air anom.		Bouguer anom.				
or tag	count	Mean	St.dev.	(m)	Mean	St.dev.	Mean	St.dev.	
				(mGal)	(mGal)	(mGal)	(mGal)	(mGal)	
		67°							
3170092	7	-145.7	29.6	48.9	2.5	58.8	2.2		
3170093	9	-202.4	78.2	38.2	7.5	51.6	4.6		
3170094	6	-148.2	30.3	38.9	5.1	48.7	5.8		
3170095	4	-139.0	20.2	32.4	3.4	41.5	4.6		
		66°							
3170096	0								
3170097	0								
3170098	0								
3170099	0								
		65°							
3170100	0								
3170101	0								
3170102	0								
3170103	0								
		64°							
3170104	1	-71.0	0.0	36.5	0.0	41.3	0.0		
3170105	7	-86.9	5.7	38.1	1.6	44.1	1.7		
3170106	10	-124.9	24.7	40.3	3.1	49.1	4.8		
3170107	4	-385.3	340.7	37.1	12.6	63.1	9.0		
		63°							

